System Integration & Test

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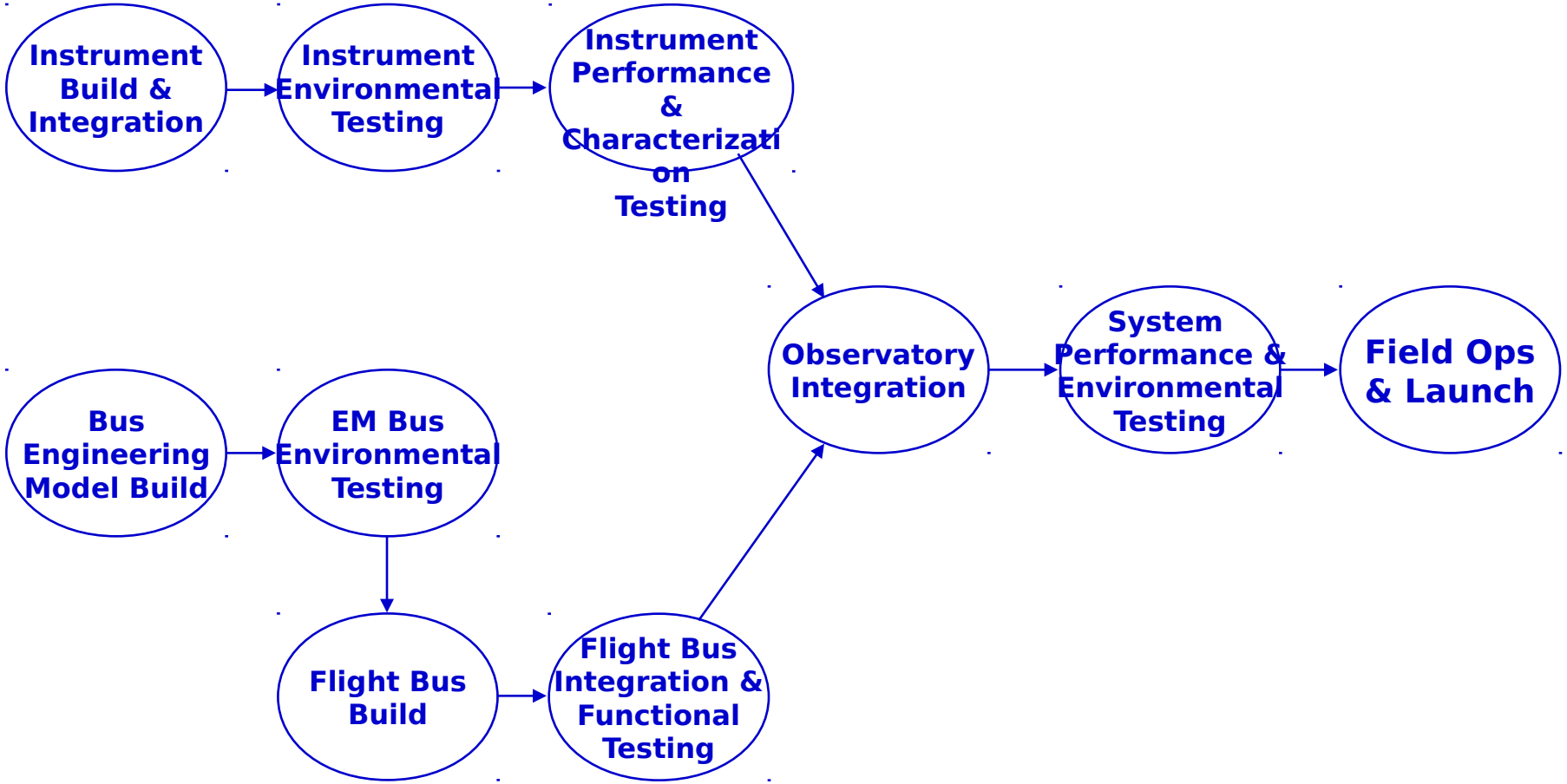
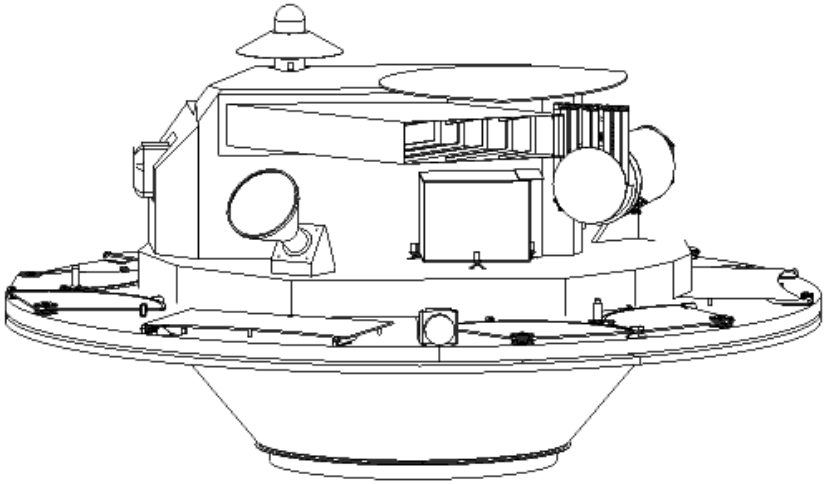
Top Level System I&T Flow



System Environmental Testing

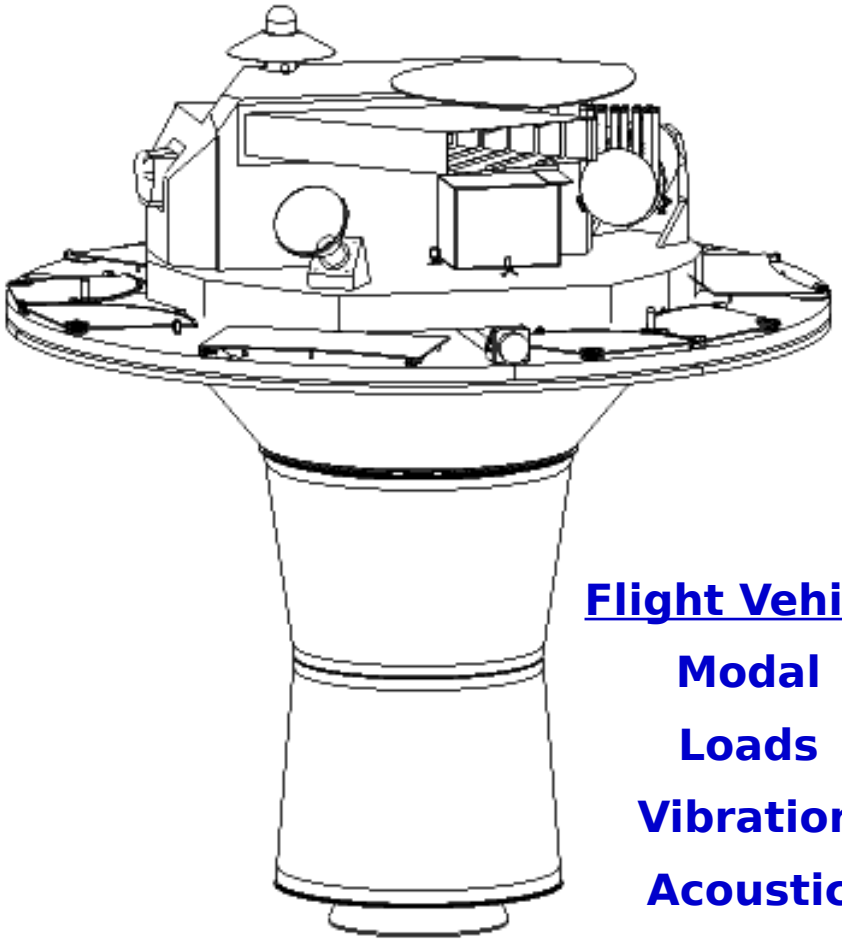
- **Flight Observatory (and Flight Vehicle)**
  - **The Observatory/FV Will Undergo Vibro-Acoustic Testing at the Protoflight Level (Flight +3db for 1 Minutes/Axis)**
  - **The Observatory Will Undergo Thermal Vacuum Testing at the Protoflight Level (10°C Above & Below Design Limits)**
  - **The Observatory Will Also Undergo:**
    - **Magnetic Balance**
    - **EMI/EMC**
    - **Spin Balance/Mass Properties Determination**
    - **Pyroshock**
    - **Series of Functional & Performance Tests**
  - **Alignments Will Be Measured Pre-Test, Post Vibro-Acoustic, and Post TVAC**
- **A Test Procedure With Be Written and Released for Each System Level Environmental Test. Procedures Will Detail:**
  - **Test Sequence, Test Levels & Tolerances**
  - **Test Article and Test Facility Configuration**
  - **Responsibilities & Success Criteria**

System Test Configurations



Observatory

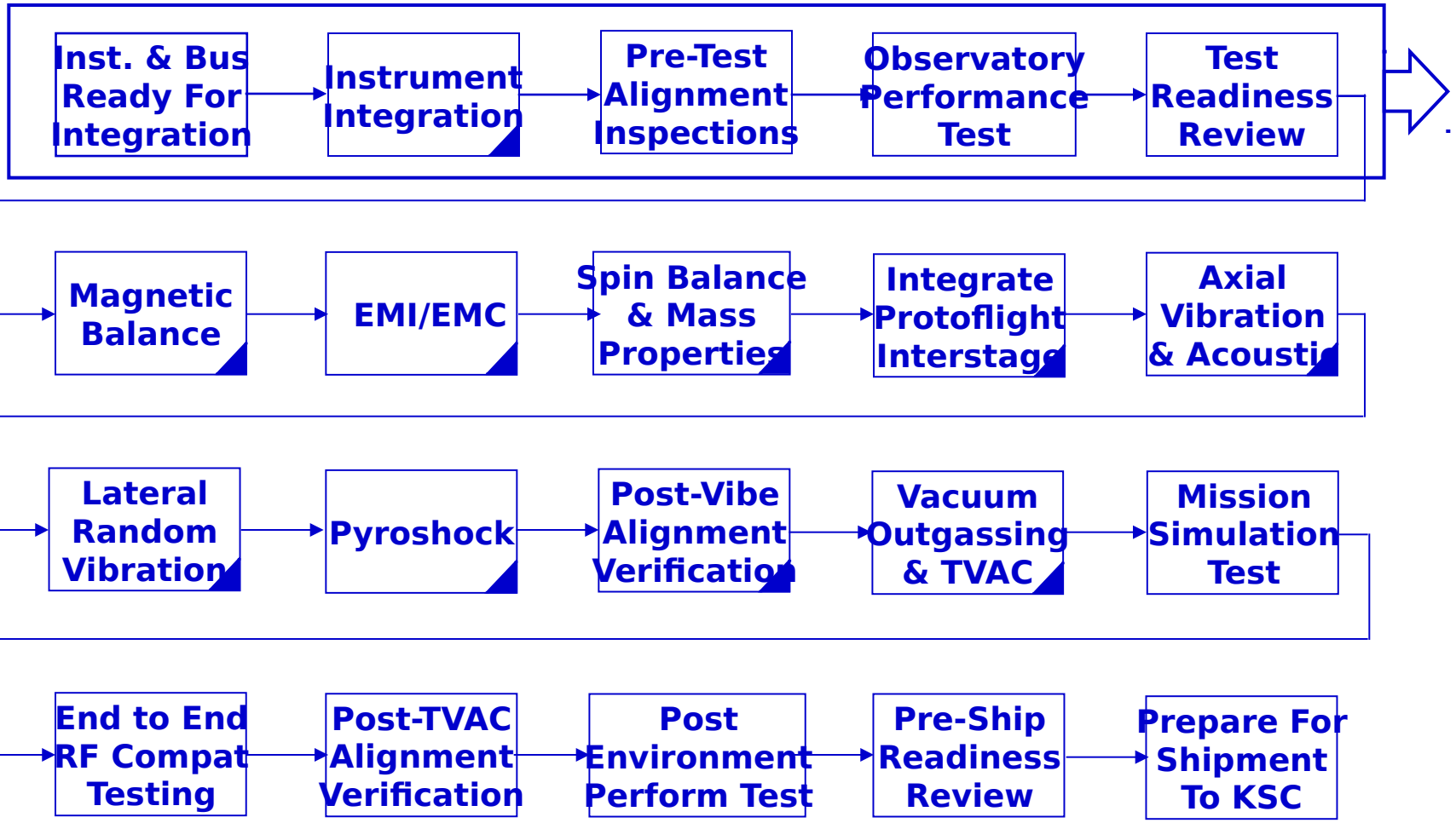
- Sensor Alignments
- Magnetic Balance
- EMI/EMC
- Spin Balance
- Thermal Vacuum



Flight Vehicle

- Modal
- Loads
- Vibration
- Acoustic
- Pyroshock

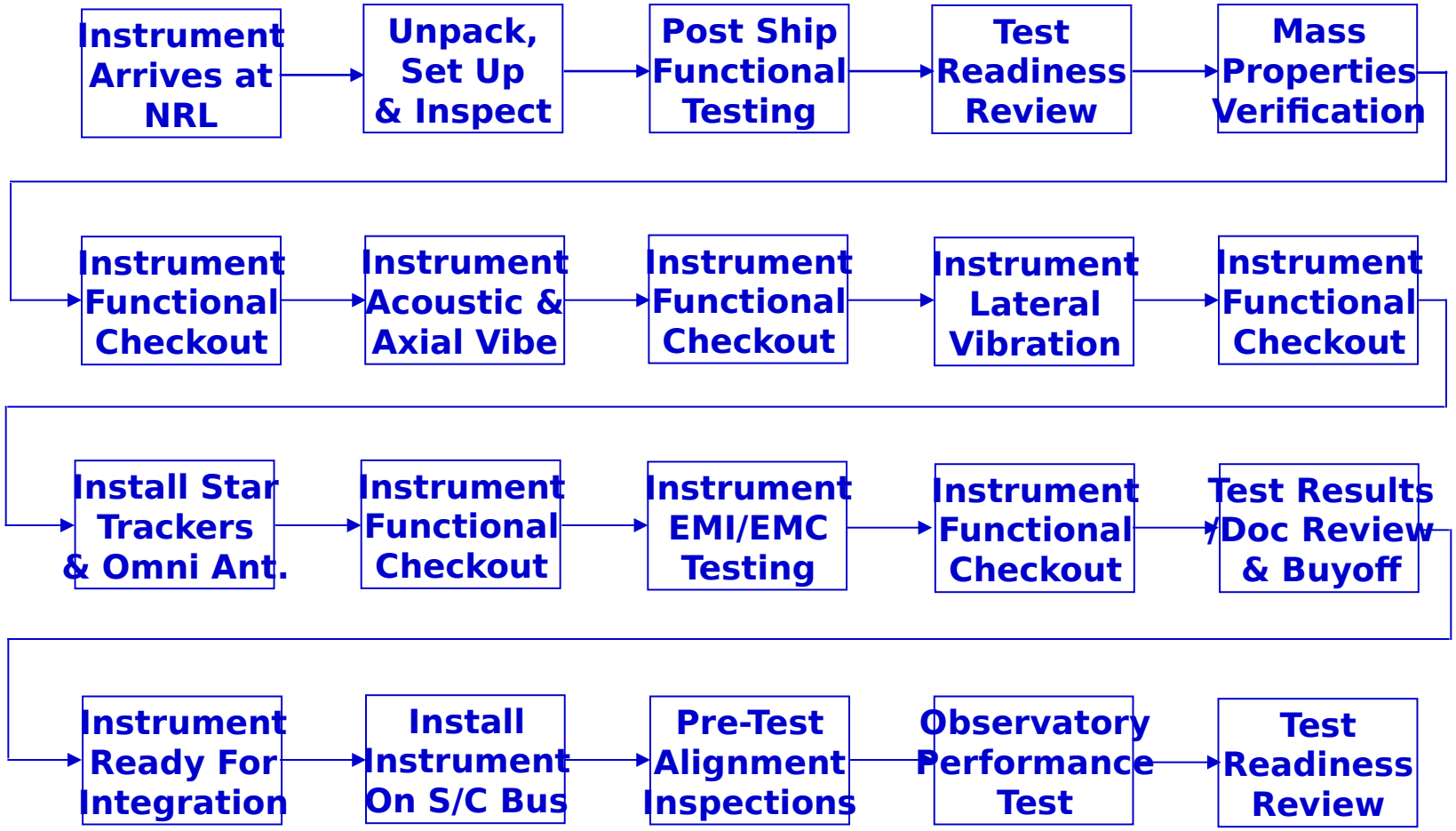
System Test Flow



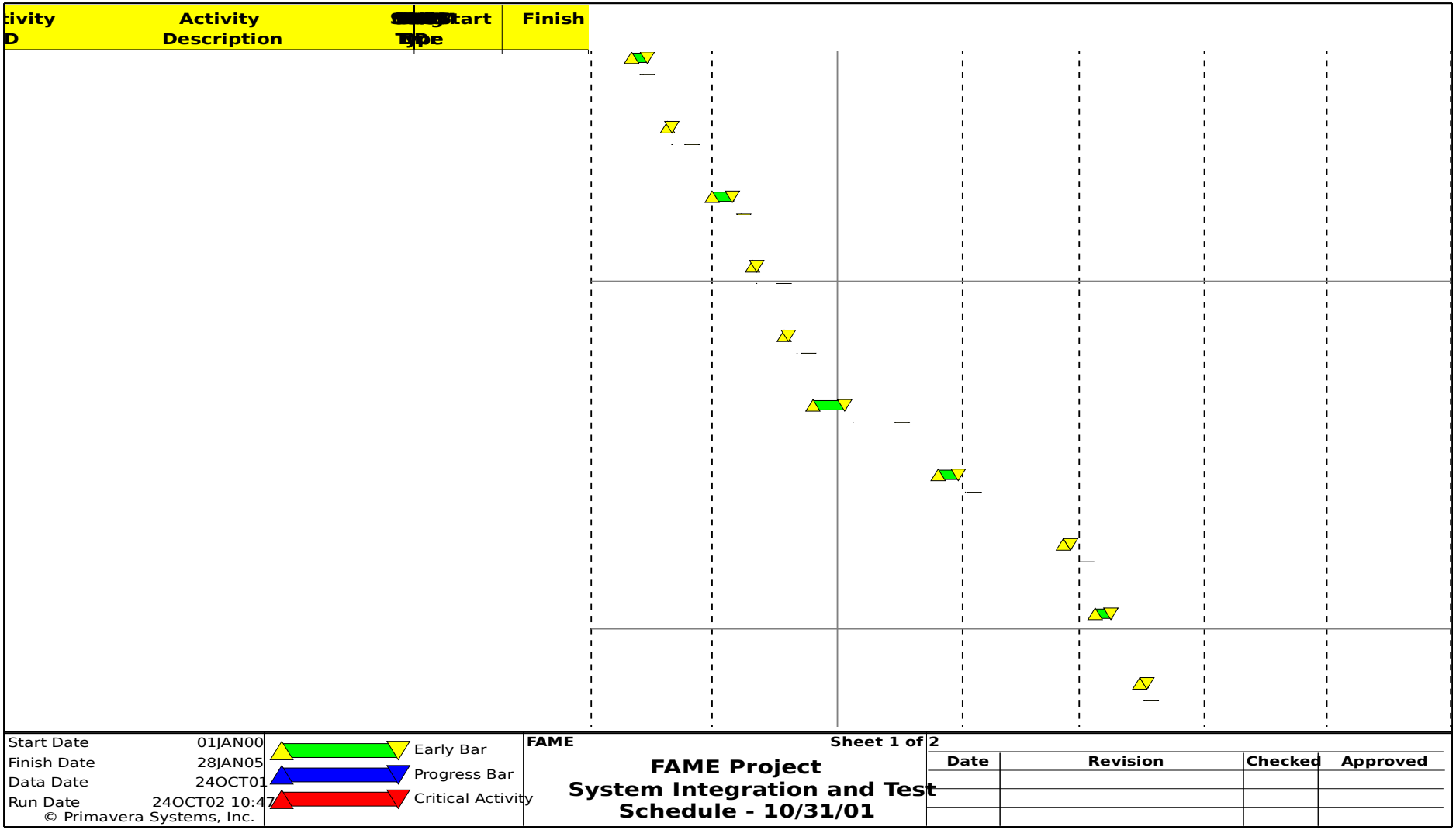
◢ = System Functional Test Performed After Completion of Test

Instrument Integration Flow

- **In Addition to the Environmental Testing Performed at LM ATC, the Instrument Will Undergo a Series of Environmental (And Functional) Tests at NRL Prior to Integration With the Spacecraft:**

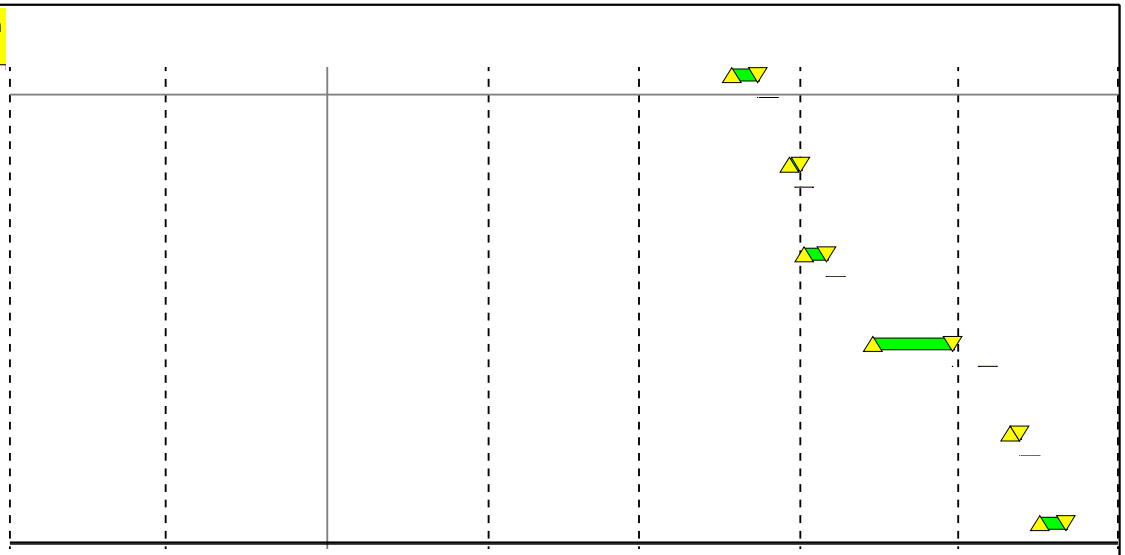


System I&T Schedule (1 of 2)



System I&T Schedule (2 of 2)

Activity ID	Activity Description	Start	Finish



System I&T Issues

- **Balancing Contamination Control Concerns With Requirements for Spin Balancing & Demonstrating Instrument Aperture Door Operation**
  - **Current Baseline is to Open Aperture Doors a Total of Five Times During I&T Activities at NRL and KSC**
    - **At Instrument Level (At NRL)**
      1. **Manually Open (Inside Bag) for Mass Properties**
    - **At Observatory Level**
      2. **Once for Functional Testing After Instrument is Integrated With Bus**
      3. **Manually Open (Inside Bag) for Spin Balance**
      4. **Once During Observatory Level TVAC**
    - **Pre-Launch Operations at KSC**
      5. **As Part of Post-Ship/Pre-Launch Functional Testing**

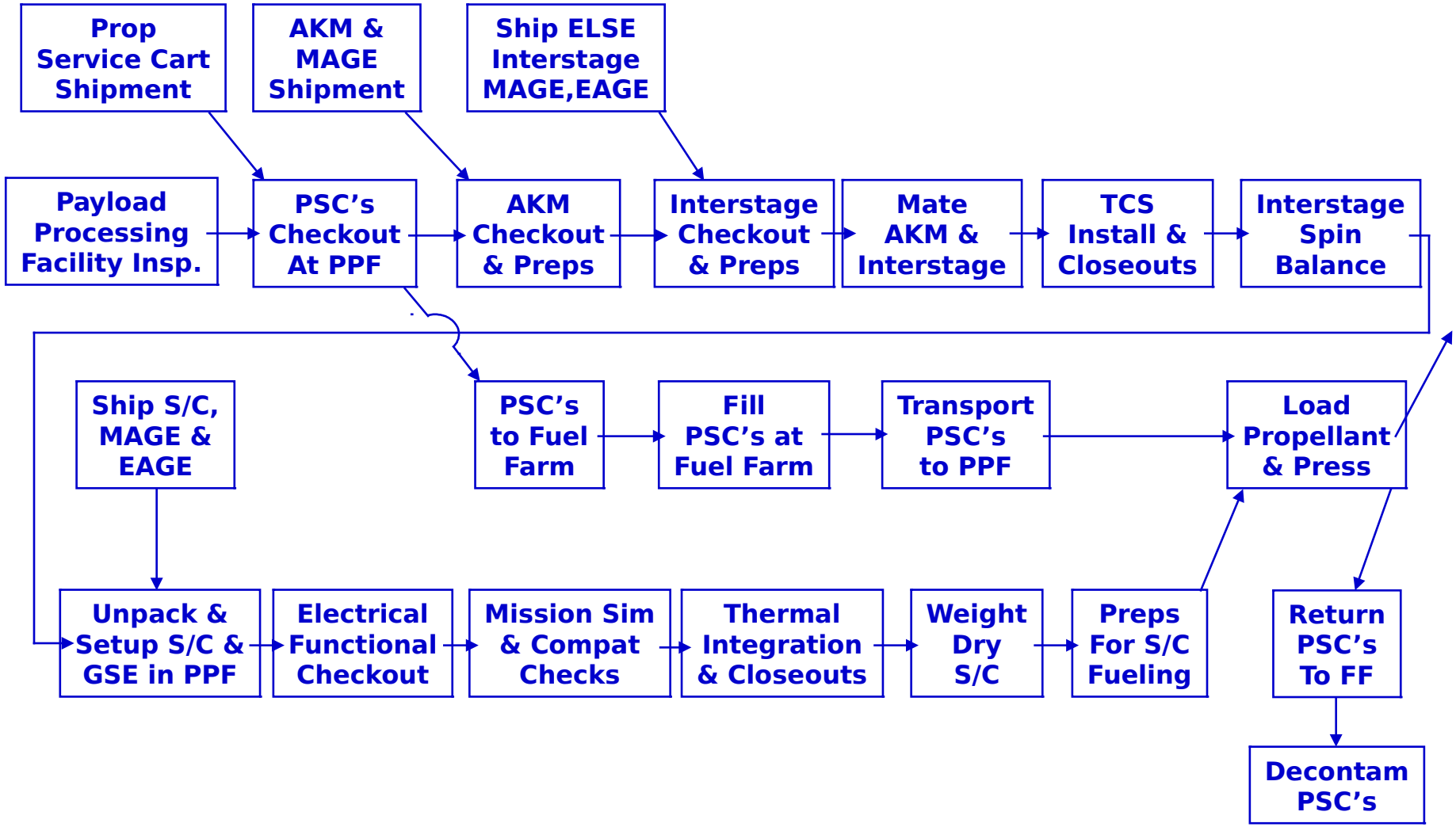
Field Operations Requirements

- **Requirements for FAME Field Operations Are Captured in Following Documents:**
  - **NCST-ICD-FM002, FAME Spacecraft to Launch Vehicle Interface Requirements Document**
  - **EWR 127-1 Tailored As Detailed in NCST-D-FM010, FAME System Safety Program Plan**
  - **KHB 1710.2D, Kennedy Space Center Safety Practices Handbook**
  - **NCST-D-FM021, FAME Training and Badging Plan for KSC and Eastern Range Operations**
  - **NCST-D-FM023, FAME Field Procedure Guideline**
  - **FAME RF Plan for KSC/ER Operations**
  - **FAME Launch Site Support Plan for KSC/ER Operations**
  - **FAME Transportation Plan for KSC/ER Operations**
  - **FAME Communications Plan for KSC/ER Operations**

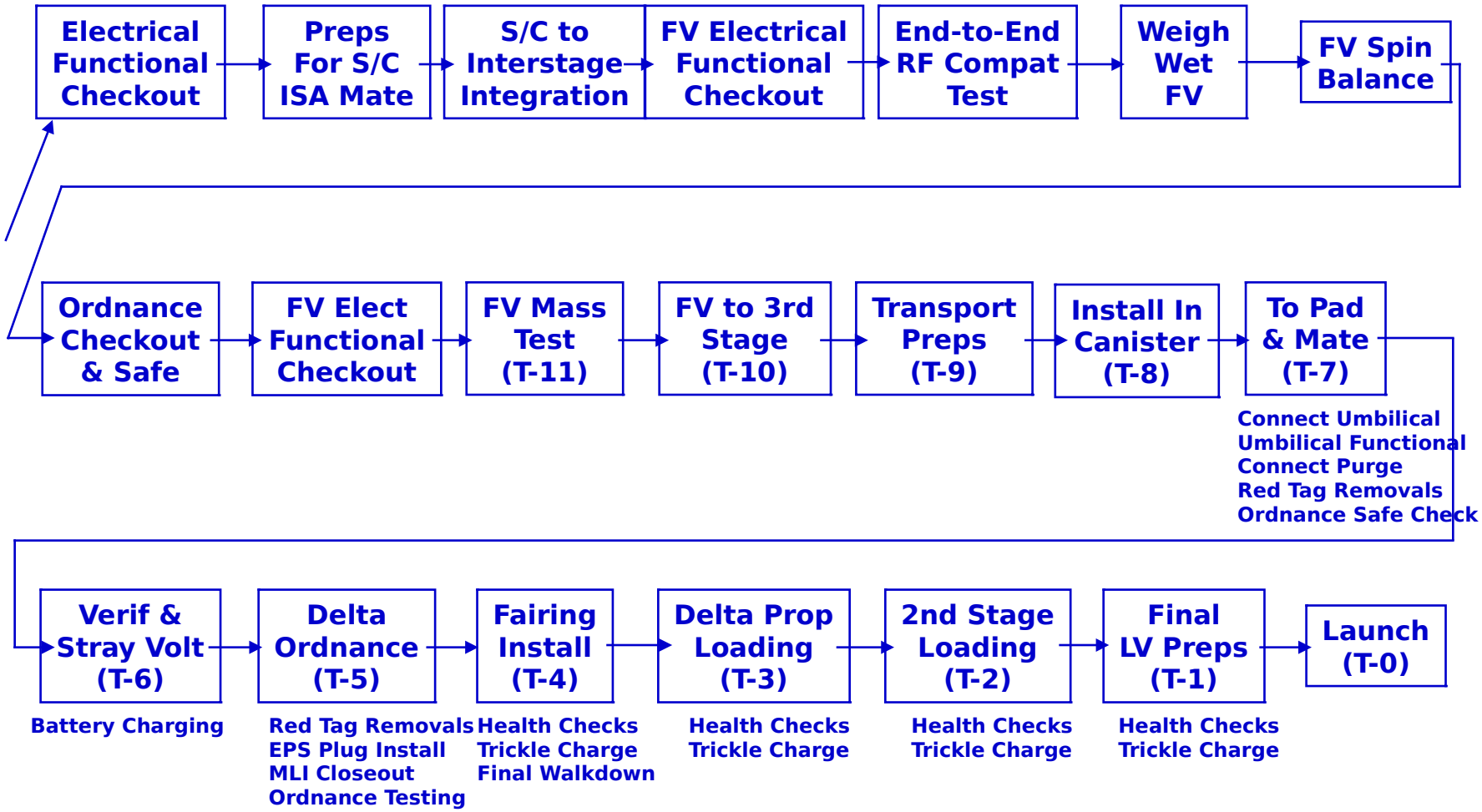
Field Operations Tasks

- **Field Operations Activities Are Split up in 7 Major Task Areas:**
  - **Prepare For Payload Processing**
    - **Includes Walkdown & Cleaning Payload Processing Facility (PPF), AKM Ship & Checkout, Integration of AKM & Interstage**
  - **Transport & Process Payload**
    - **Transportation of Observatory, MAGE, EAGE to KSC, Functional & Compatibility Tests, Thermal Closeouts**
  - **Prepare For Propellant Loading & AKM Mate**
    - **Prep & Loading of Servicing Carts, S/C Dry Weight**
  - **Load Propellant & Pressurant**
    - **Hydrazine and Helium Loading**
  - **Mate Spacecraft With Interstage**
    - **Installation of Clampband and Closeouts**
  - **Post Mate Processing**
    - **Wet Weight, Spin Balance, Functional & Compatibility Tests**
  - **Integrated Operations With Launch Vehicle**
    - **Activities From T-11 to Launch, Including Transport to Pad, Mate With LV, Red Tag Removal, Charging, Arming**

Field Operations Flow (1 of 2)

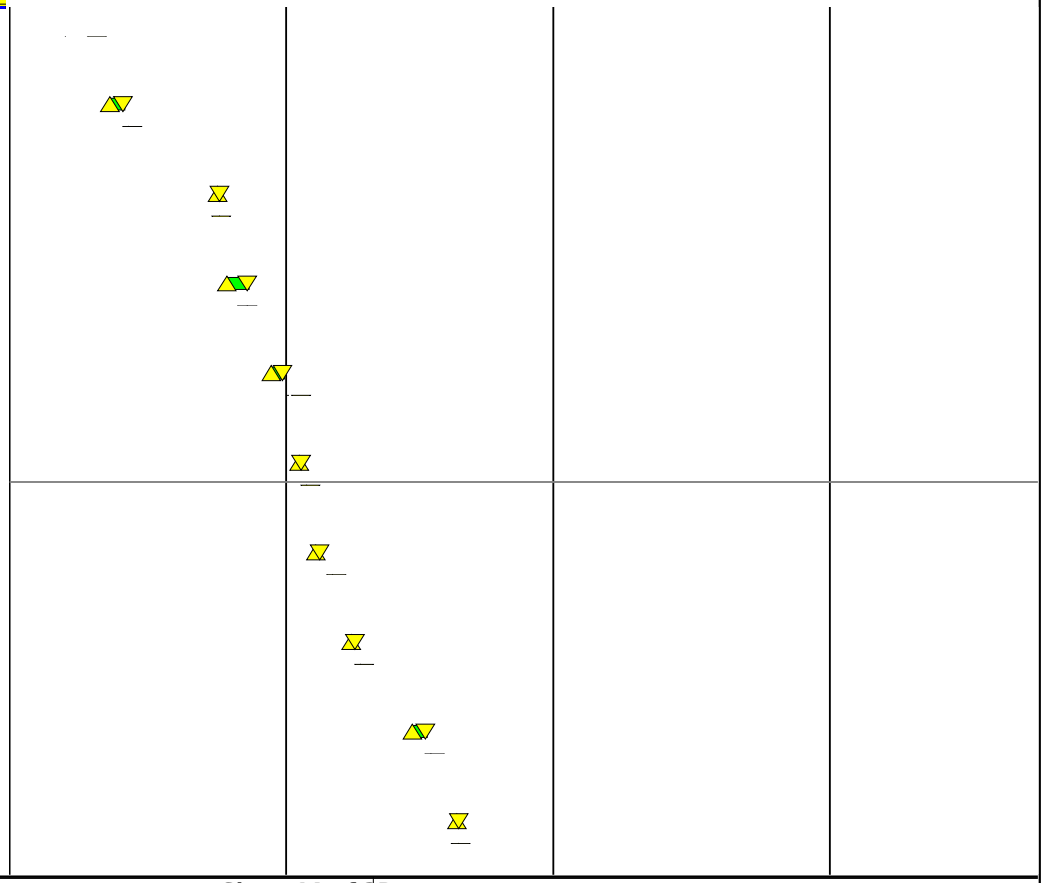


Field Operations Flow (2 of 2)



Field Ops Schedule (1 of 3)

tivity ID	Activity Description	Early Start	Finish



Start Date	01SEP01 07:00	Early Bar	GOPS	Sheet 1A of 3B		
Finish Date	18NOV04 16:59	Progress Bar	FAME Project Field Operations 10/31/01			
Data Date	15OCT01 07:00	Critical Activity				
Run Date	24OCT02 10:24					
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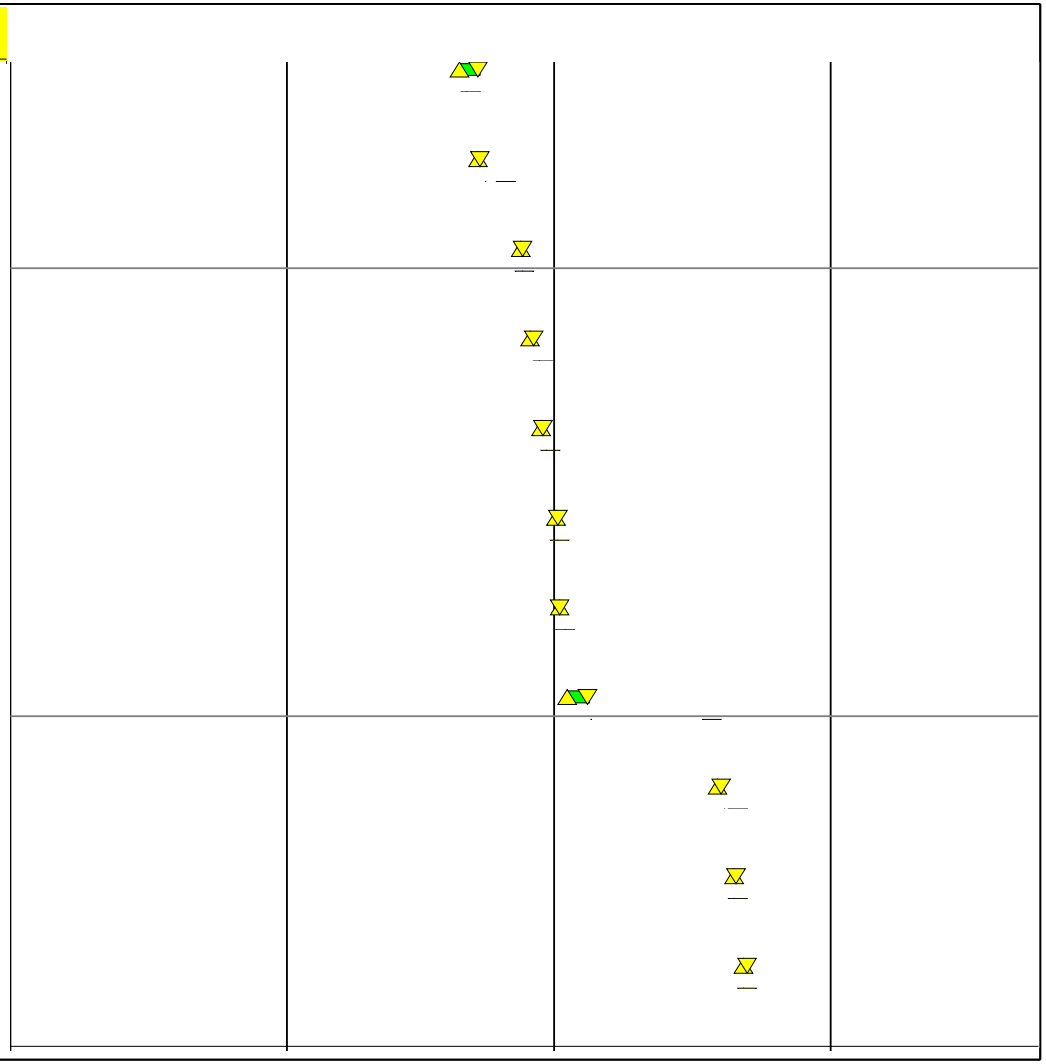
Date	Revision	Checked	Approved

Field Ops Schedule (2 of 3)

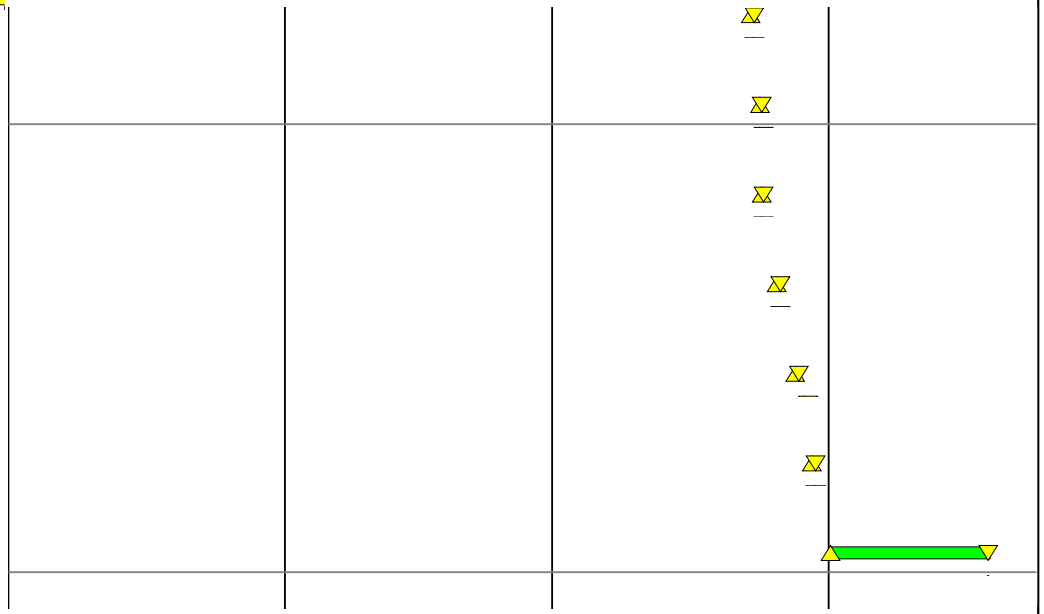
tivity ID	Activity Description	[redacted] Start	Finish



Sheet 2A of 3B

Field Ops Schedule (3 of 3)

tivity ID	Activity Description	Start	Finish
		DDr	



Sheet 3A of 3B

Back-Up

Instrument Arrival at NRL

Instrument GSE
- Truck & Air Ride Trailer
- Instrument Container with Environmental Control Sys
- Instrument Purge System
- All Required GSE Shipped
- Escorts as Required

NRL GSE
- Forklift(s)
- Certified Facility Ground
- Certified Ground Cables
- Ladders
- Cleaning Equipment

Truck Arrival
- Coordinate Arrival Time
- Notify Guard Force
- Meet Truck at Gate
- Review Route to A59
- Position Trailer in A59 Receiving Area
- Wipe Down Containers as Required

In Building A59
- Personnel Briefing
- Remove Container & Crates From Truck & Place in High Bay
- Attach Facility Ground to Instrument Container
- Inspect Purge System
- Inspect All Containers/Crates
- Download Environmental Recorder, Perform Quick Look at Data
- Allow Temperature to Equalize Overnight

Unpack, Set-up, and Inspect

Instrument GSE
- GSE to Remove Shipping Box Cover
- Instrument Lift Fixture
- Instrument Dolly
- Instrument EGSE
- GN2 Purge Equipment

Prerequisites
- Lifting Procedures Released
- Dolly Installation Procedure

NRL GSE
- Overhead Crane
- Pallet Jacks
- Hand Tools
- Certified Clean Room
- Clean Room Supplies
- Certified Facility Grounds
- Certified Ground Cables

In Building A59 High Bay
- Personnel Briefing
- Verify Facility Ground
- Unpack & Inspect Container Top Lift Fixture (Check Certifications)
- Remove Top From Shipping Container
- Attach Instrument Lift Fixture to Crane
- Attach Lift Fixture to Instrument
- Remove Instrument From Container
- Install Instrument Into Handling Dolly
- Disconnect Lift Fixture
- Relocate/Install Purge
- Verify & Connect to Facility Ground
- Roll Into Clean Room
- Attach to Clean Room Facility Ground
- ~~Perform Visual Inspection of~~ Instrument
- Perform Cleanliness Verification
- Unpack, Inspect, & Set-up GSE
- Perform Functional Checkout of GSE

Post Shipment Functional Testing

Instrument GSE
- Instrument EGSE
- Test Cables
- GN2 Purge Equipment

Prerequisites
- Functional Test Procedure
- EGSE Verification Performed

NRL GSE
- Facility Power
- Class 1000 Clean Room
- Clean Room Supplies
- Certified Facility Ground

In Clean Room
- Verify Proper Grounding
- Connect EGSE to Instrument
- Instrument Power Up Sequence
- Establish EGSE Comm to Instrument
- Verify Telemetry Data
- Perform Charge Injection Testing
- Flat Field Testing With Internal Source
- Optics Verification Using FPA LED
- Active Focus Adjustment and Return
- Instrument Power Down Sequence
- Compare Results to Pre-Ship Data

Instrument Test Readiness Review

Prerequisites
- Instrument Post-Ship Functional Testing Complete
- Environmental Test Procedures Released
- Open Item Audit and Evaluation (DRs, NMRS)
- Configuration Audits (As Built Configuration List)
- Functional Test Analysis/Evaluation Complete
- Pre/Post Ship Data Compared

Instrument Mass Properties

Instrument GSE
- GN2 Purge Equipment
- Instrument Lift Fixture
- Instrument Dolly

Prerequisites
- Pre-Test Functional
- Instrument Lifting Procedure
- Flexure Hole Pattern Installed in Test Fixture
- Fixture Balanced & Indexed
- ABCL
- Test Procedure Released
- Star Trackers & Omni Mass Simulators Installed

NRL GSE
- Spin Table Fixture
- Overhead Crane
- Ground Cable
- Certified Facility Ground
- Hand Tools

In Clean Room
- Manually Open Instrument Doors
- Tape Down Bag to Instrument
- Transport Instrument on Dolly From Clean Room to Spin Balance Machine

At Spin Balance Machine
- Personnel Briefing
- Attach Instrument Lift Fixture to Crane
- Attach Lift Fixture to Instrument
- Offload Weight and Remove Dolly Attach Bolts
- Lift Instrument Off Dolly & Place on Spin Table Fixture
- Torque Flexure Bolts
- Disconnect Lift Fixture
- Maintain Purge Until Ready to Spin
- Disconnect Purge For Spins
- Reattach Purge After Spins
- Attach Instrument Lift Fixture to Crane
- Attach Lift Fixture to Instrument
- Remove Flexure Bolts
- Lift Instrument Off of Spin Table and Place on Dolly, Install Bolts
- Disconnect Lift Fixture
- Return Instrument to Clean Room
- Perform Post-Test Functional

Instrument Acoustic & Axial Vibe

Instrument GSE
- GN2 Purge Equipment
- Instrument Dolly
- Instrument Lift Fixture
- Internal Accelerometers

Prerequisites
- ABCL
- Instrument Lifting Procedure
- Test Procedure Released
- Pre-Test Functional
- Vibe Table Adapter Plate Drilled for Instrument Flexures
- Star Tracker & Omni Mass Sims Installed on Instrument
- External Accelerometers Installed Per Procedure

NRL GSE
- Overhead Crane
- Vibe Table Adapter Plate
- Certified Facility Ground
- Instrument External Accels
- Accelerometer Cables
- Hand Tools

Axial Random Vibration
- Transport Instrument From Clean Room to Acoustic Chamber
- Maintain GN2 Purge
- Personnel Briefing
- Attach Instrument Lift Fixture to Crane
- Attach Lift Fixture to Instrument
- Offload Weight & Remove Dolly Attach Bolts
- Lift Instrument Off Dolly and on to Vibration Plate
- Install and Torque Flexure Bolts
- Disconnect Lift Fixture
- Connect Accelerometer Cables, & Checkout
- Perform Test, Notch as Required to DLL

Acoustic
- Set up Acoustic Chamber for Acoustic Test
- Perform Lower Level Test & Check Responses
- Perform Full Level Test
- Attach Instrument Lift Fixture to Crane
- Attach Lift Fixture to Instrument
- Remove Flexure Bolts
- Lift Instrument Off of Vibration Plate and Place on Dolly, Install Bolts
- Disconnect Lift Fixture
- Return Instrument to Clean Room
- Perform Post-Test Functional

Instrument Lateral Vibration

Instrument GSE
- GN2 Purge Equipment
- Instrument Dolly
- Instrument Lift Fixture
- Internal Accelerometers

Prerequisites
- ABCL
- Instrument Lifting Procedure
- Test Procedure Released
- Pre-Test Functional
- Acoustic & Axial Vibe Complete
- Vibe Table Adapter Plate Drilled for Instrument Flexures
- Star Tracker & Omni Mass Sims Installed on Instrument
- External Accelerometers Installed Per Procedure

NRL GSE
- Overhead Crane
- Certified Facility Ground
- Instrument External Accelerometers
- Hand Tools

First Lateral Axis
- Transport Instrument From Clean Room to Vibration Laboratory
- Maintain GN2 Purge
- Personnel Briefing
- Attach Instrument Lift Fixture to Crane
- Attach Lift Fixture to Instrument
- Offload Weight & Remove Dolly Attach Bolts
- Lift Instrument on to Vibration Plate
- Install and Torque Flexure Bolts
- Connect Accelerometer Cables, & Checkout
- Perform Test, Notch as Required

Second Lateral Axis
- Rotate Test Article 90º
- Verify Instrumentation
- Maintain GN2 Purge
- Install and Torque Flexure Bolts
- Perform Test, Notch as Required to DLL
- Attach Instrument Lift Fixture to Crane
- Attach Lift Fixture to Instrument
- Remove Flexure Bolts
- Lift Instrument Off of Vibration Plate and Place on Dolly, Install Bolts
- Disconnect Lift Fixture
- Return Instrument to Clean Room
- Perform Post-Test Functional

Star Tracker & Antenna Install

Instrument GSE
- GN2 Purge Equipment
- Instrument Dolly

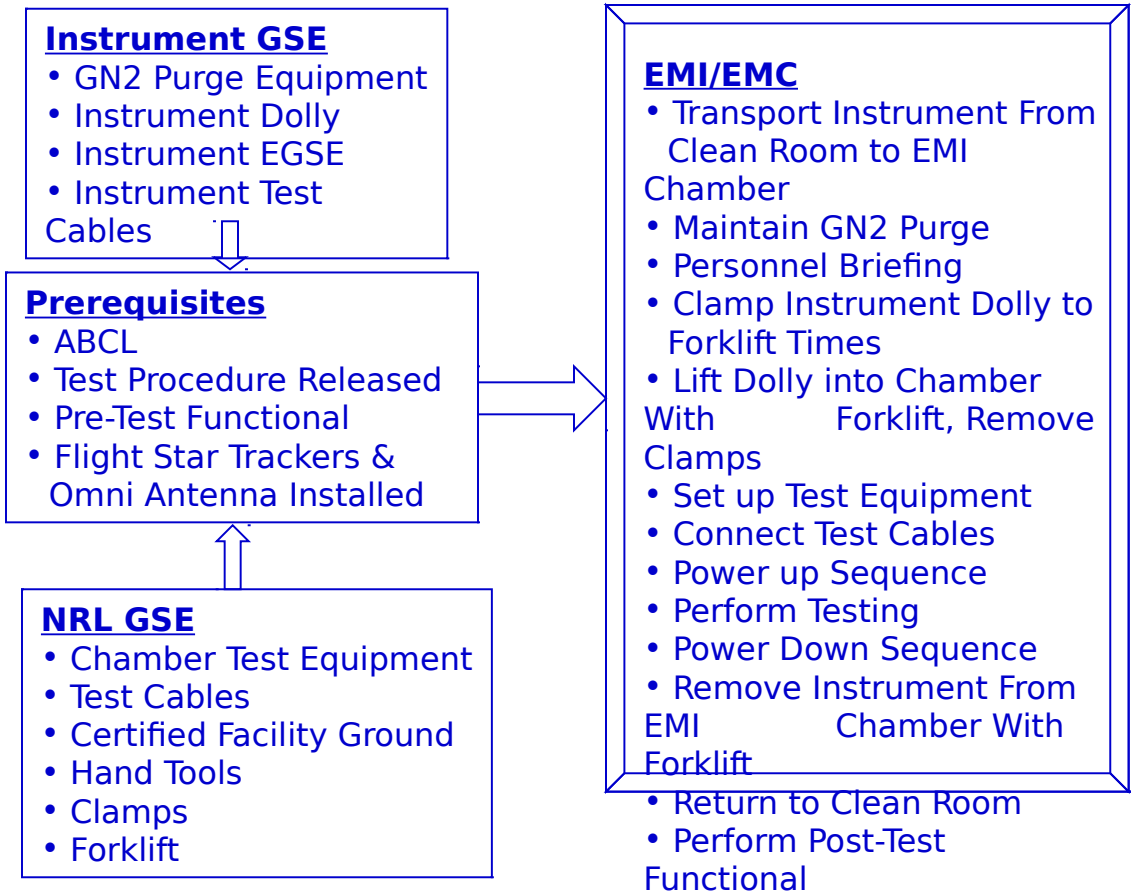
Prerequisites
- Released Assembly Drawing
- Released Installation Procedure
- Vibro-Acoustic Tests Complete
- Star Tracker Assembly Buy-off
- Star Tracker Assembly Certified to level 500A

NRL GSE & Hardware
- Installation Tooling
- Fasteners for Star Tracker & Omni Installation
- MLI Closeout Materials For Star Tracker & Omni Antenna
- Hand Tools

Instrument Prep
- Maintain GN2 Purge
- Clean and Remove Mass Sim Bags
- Disconnect Flight Harness From Mass Simulators
- Remove Star Tracker & Omni Mass Simulators From Instrument

Star Tracker/Omni Installation
- Clean/Prepare Surfaces
- Install Star Trackers
- Install Antenna
- Verify Torque on All Fasteners
- Clean & Inspect Connectors
- Flight Mate Wire Harness & Coax
- Torque & Stake Connectors
- Perform Functional Checkout of Star Trackers & Omni Antenna
- Install MLI Closeouts
- Install Bags Over Star Trackers & Omni Antenna

Instrument EMI/EMC



Test Results Review & Buyoff

Prerequisites

- Instrument Post Ship Checkout Complete
- Instrument Mass Properties, Vibro-Acoustic & EMI/EMC Testing Successfully Completed
- Environmental Test Reports Complete
- Open Item Audit and Evaluation (DRs, NMRS)
- Configuration Audits (As Built Configuration List)
- Functional Test Analysis/Evaluation Complete

Instrument Integration With S/C

Instrument GSE
- GN2 Purge Equipment
- Instrument Dolly
- Instrument Lift Fixture

Prerequisites
- Instrument Buyoff Complete
- Instrument Lifting Procedure
- Assembly Drawing Released
- Installation Procedure Released
- Star Trackers/Omni Installed
- S/C & Instrument Grounded
- Instrument & S/C Captive MLI Installed
- S/C in High Bay & Leveled
- Mounting Locations on S/C Drilled With Template

NRL GSE & Hardware
- Overhead Crane
- 1000 Lb Capacity Hydroset
- Inclinometer
- Optical Inspection Equipment
- Instrument Flexure Shims
- Instrument Mounting Bolts
- Hand Tools

Instrument Installation on Bus
- Personnel Briefing
- Verify S/C Level
- Inspect and Clean Instrument Mounting Points on Bus
- Transport Instrument From Clean Room to High Bay
- Attach Hydraset & Instrument Lift Fixture to Crane
- Attach Lift Fixture to Instrument
- Offload Weight and Remove Dolly Attach Bolts
- Lift the Instrument
- Inspect and Clean Flexures
- Translate Instrument over Bus
- Verify Instrument to Bus Orientation
- Lower Instrument on to Bus
- Install Flexure Bolts
- Off load Instrument Weight to Bus
- Torque Mounting Bolts
- Inspect Tip/Tilt Alignment
- Shim Under Flexures as Required to Meet Alignment Requirements
- Perform Final Mounting Torque Verification
- Transport Observatory to Clean Tent

Electrical & RF Connections
- Connect Instrument to Bus Ground
- Perform Ground Audits
- Remove Instrument Facility Ground
- Verify Electrical Power Polarity
- Clean and Inspect Connectors
- Flight Mate Connectors and RF Coax
- Torque and Stake Connectors

Instrument To Bus Mate Complete

Alignment Inspection/Verification

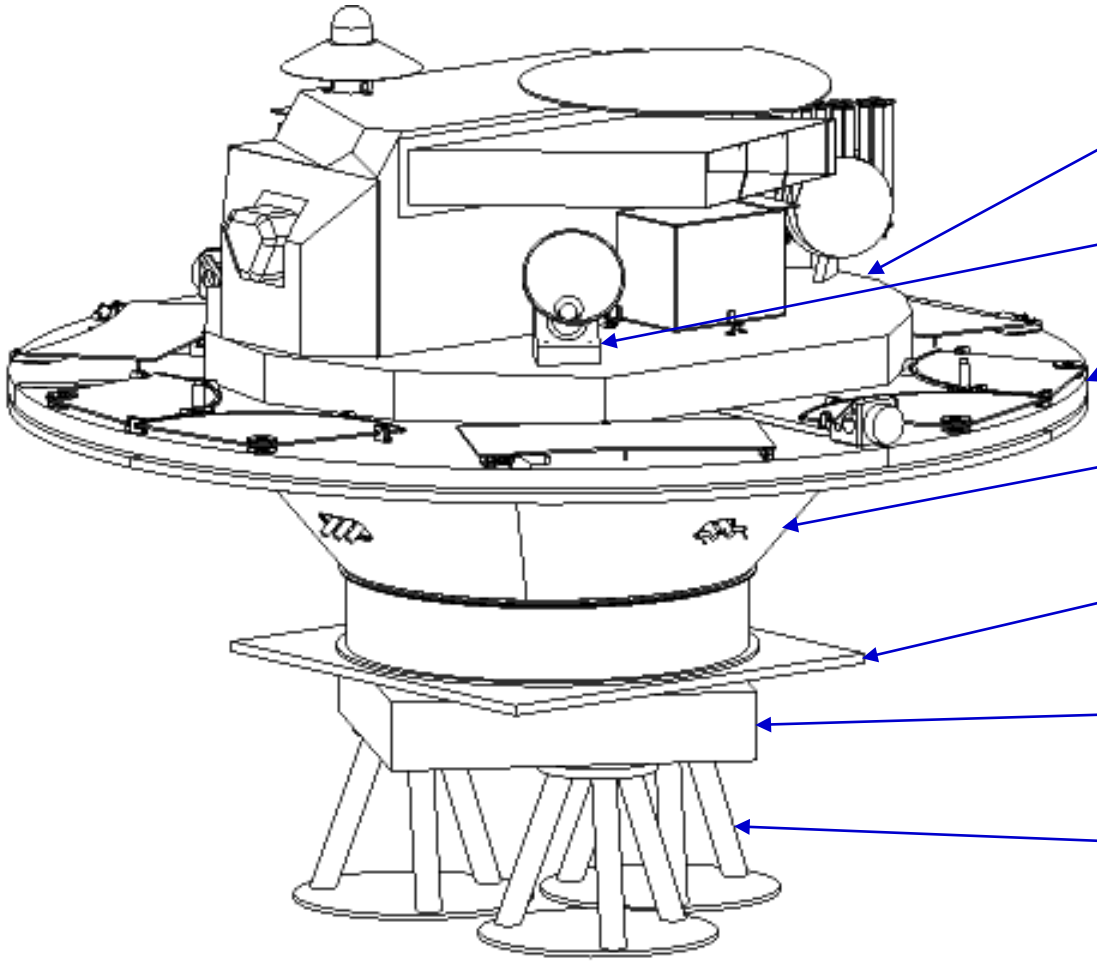
Instrument GSE
- GN2 Purge Equipment

Prerequisites
- Test Procedure Released
- Instrument Integration Complete (For Baseline Alignment Inspection), OR:
- Environmental Test(s) Complete (For Post-Test Alignment Verifications)
- Rotary Table Leveled
- Theodolites Calibrated

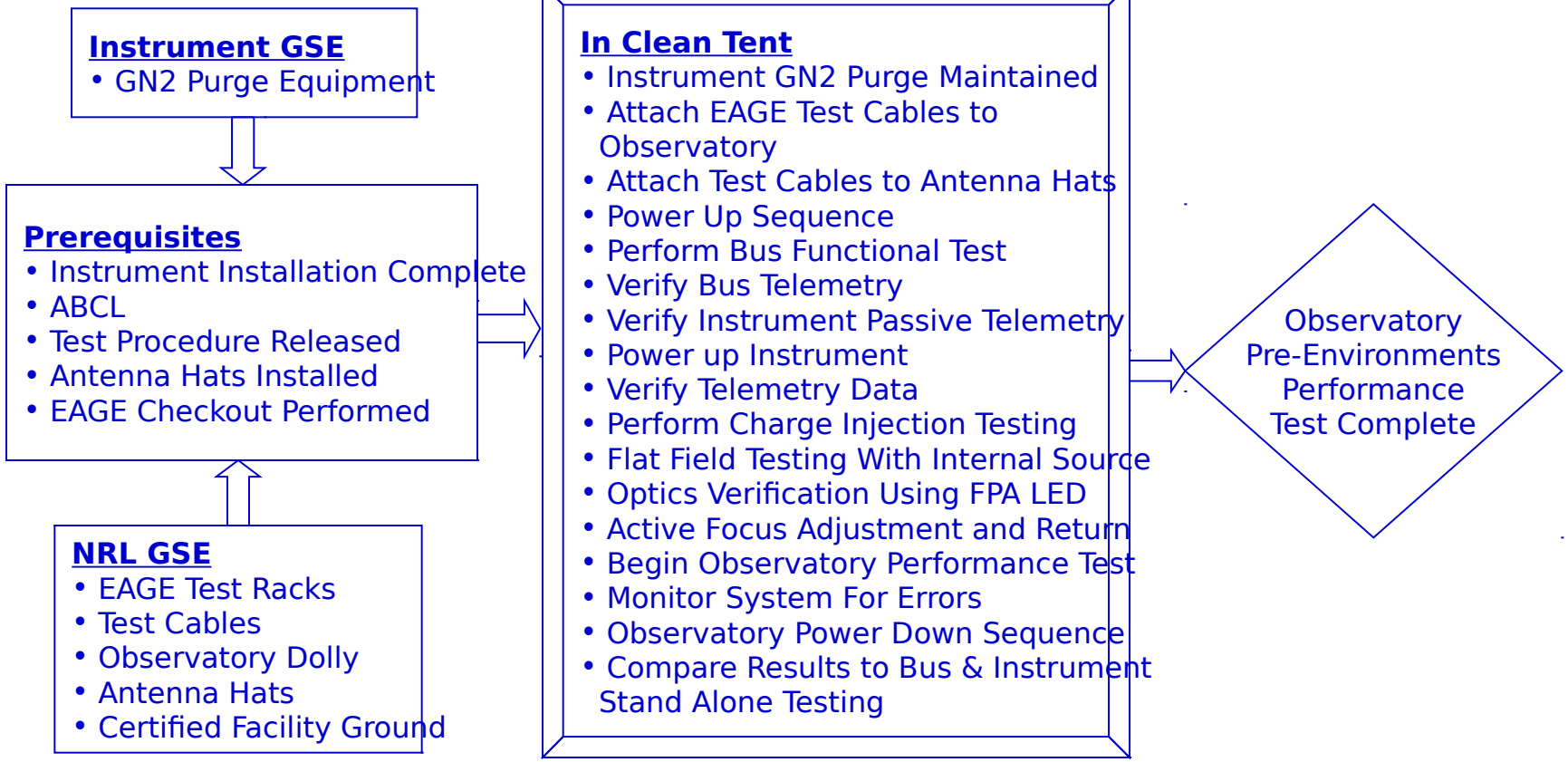
NRL GSE
- Observatory Dolly
- Observatory Lift Fixture
- Observatory Test Adapter
- Precision Rotary Table
- Theodolites & Stands
- Vertical & Horizontal Bars
- Precision Inclinometer
- Precision Tooling Plate(s)
- Certified Facility Ground
- Optical Targets
- Hand Tools
- Overhead Crane

Alignment Inspections
- Personnel Briefing
- Transport Observatory From Clean Tent to High Bay
- Maintain Instrument GN2 Purge
- Maintain Ground Connection
- Attach Observatory Lift Fixture to Crane
- Attach Lift Fixture to Observatory
- Lift Observatory Off Dolly & on to Test Adapter/Rotary Table
- Check Rotary Table Level
- Perform All Alignment Inspections Defined in Procedure
- Attach Observatory Lift Fixture to Crane
- Attach Lift Fixture to Observatory
- Lift Observatory Off Fixture & on to Dolly, Secure Clamp
- Return Observatory to Clean Tent
- Perform Post Test Functional
- Document Baseline Alignments or Compare Results to Pre-Test Inspections

Alignment Inspection Test Set-Up



Observatory Performance Test



Test Readiness Review

Prerequisites

- Observatory Pre-Environments Performance Test Complete
- Environmental Test Procedures Released
- Open Item Audit and Evaluation (DRs, NMRS)
- Configuration Audits (As Built Configuration List)
- Performance Test Analysis Complete
- Pre-Environmental Test Alignments Complete

Test Readiness Review Team
NASA, USNO, NRL, LMMS

Magnetic Balance

Instrument GSE
- GN2 Purge Equipment

Prerequisites
- TRR Successfully Completed
- Observatory to Flight Configuration
- ABCL
- Test Procedure Released
- Observatory Lifting Procedure
- Pre-Test Functional
- EAGE Checkout Performed
- NASA GFSC Portable Magnetometer Equipment Calibrated & Set Up

NRL GSE & Hardware
- Observatory Dolly
- Observatory Lift Fixture
- Observatory Test Adapter
- Magnetic Balance Dolly & Tracks
- Bus Test Adapter & Clamp
- EAGE Test Racks, Cables
- Certified Facility Ground
- Flight Balance Magnets
- Balance Magnet Holders
- Magnetometer
- Hand Tools
- Overhead Crane

Static & Dynamic Balance
- Remove Any Non-Flight Ferrous Materials From Observatory
- Personnel Briefing
- Transport Observatory From Clean Tent to New High Bay
- Maintain Instrument GN2 Purge
- Attach Observatory Lift Fixture to Crane
- Attach Lift Fixture to Observatory
- Lift Observatory Off Dolly & on to Test Adapter/Fixture
- Finish Test Set-Up Configuration
- Establish Background Readings
- Magnetic Dipole Measurement
- Balance To Fraction of Requirement
- Connect Power & Signal Cables
- Perform Power Up Sequence
- Perform Dipole Measurement
- Balance To Requirement
- Perform Power Down Sequence
- Remove Test Cables
- Attach Observatory Lift Fixture to Crane
- Attach Lift Fixture to Observatory
- Lift Observatory Off Fixture & on to Dolly, Secure Clamp
- Return Observatory to Clean Tent
- Perform Post Test Functional

Magnetic Dipole
Balance to
≤ 200 Pole-cm
Per Axis

EMI/EMC Testing

Instrument GSE
- GN2 Purge Equipment

Prerequisites
- ABCL
- Test Procedure Released
- Harness Installed for Flight
- Pre-Test Functional
- EAGE Checkout Performed

NRL GSE
- EAGE Test Racks, Cables
- Observatory Dolly
- Chamber Test Equipment
- Certified Facility Ground
- Forklift
- Hand Tools

EMI/EMC
- Transport Observatory From Clean Tent to EMI Chamber
- Maintain Instrument GN2 Purge
- Personnel Briefing
- Lift Observatory Dolly into EMI Chamber With Forklift
- Set up Test Equipment
- Connect Test Cables
- Remove Non-Flight Covers
- Perform Power up Sequence
- Perform Testing
- Power Down Sequence
- Reinstall Non-Flight Covers
- Remove Observatory From EMI Chamber With Forklift
- Return to Clean Room
- Perform Post-Test Functional

Spin Balance & Mass Properties

Instrument GSE
- GN2 Purge Equipment

Prerequisites
- Observatory to Flight Configuration
- ABCL
- Pre-Test Functional
- Test Procedure Released
- Observatory Lifting Procedure
- Fixture Balanced & Indexed

NRL GSE
- Observatory Test Adapter
- Observatory Dolly
- Observatory Lift Fixture
- Overhead Crane
- Certified Facility Ground
- Spin Balance Machine
- MOI Machine
- Hand Tools

In Clean Room
- Manually Open Instrument Doors
- Tape Down Bag to Instrument
- Transport Observatory on Dolly From Clean Tent to Spin Balance Machine
- Maintain Instrument Purge

At Spin Balance Machine
- Personnel Briefing
- Attach Observatory Lift Fixture to Crane
- Attach Lift Fixture to Observatory
- Lift Observatory Off Dolly & Place on Test Adapter, Install Clamp
- Disconnect Lift Fixture
- Remove Non-Flight Items (Covers)
- Maintain Purge Until Ready to Spin
- Disconnect Instrument Purge For Spins
- Reattach Purge Line After Spins
- Spin Balance to Requirement
- Move Observatory to MOI Machine
- Perform Inertia Testing
- Reinstall Protective Covers
- Attach Observatory Lift Fixture to Crane
- Attach Lift Fixture to Observatory
- Lift Observatory Off of Spin Table and Place on Dolly, Install Clamp
- Disconnect Lift Fixture

Axial Random Vibe & Acoustic

Instrument GSE
- GN2 Purge Equipment
- Internal Accelerometers

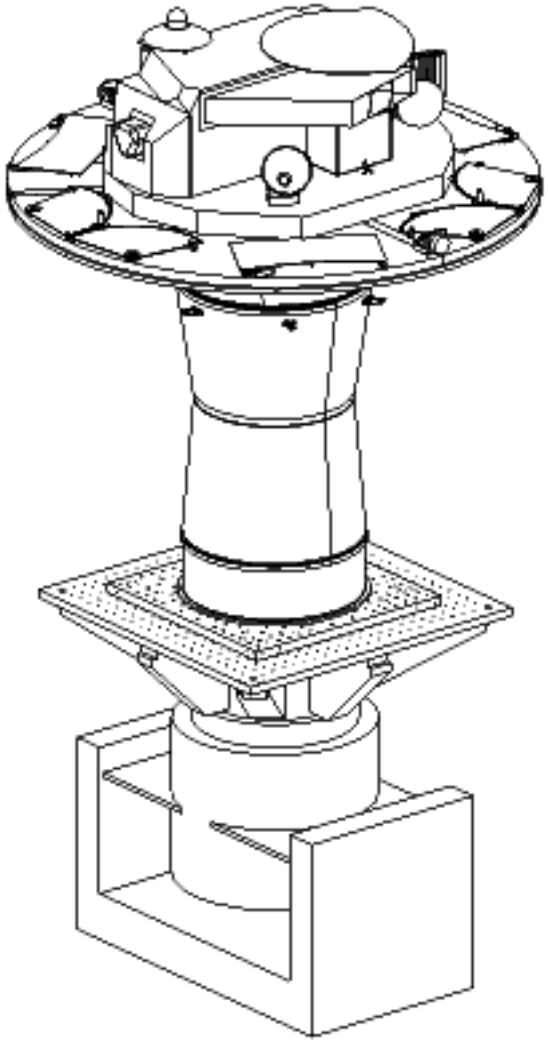
Prerequisites
- ABCL
- Pre-Test Functional
- Test Procedure Released
- Observatory Lifting Procedure
- Engineering Model Modal Test Done
- Build Up Interstage With AKM Mass Sim
- Vibration Table Adapter Plate Drilled For FV Test Adapter / PAF Bolted Down
- Accelerometers Installed Per Procedure
- EAGE Checkout Performed

NRL GSE & Hardware
- EAGE Test Racks/Cables
- Observatory Dolly
- Observatory Lift Fixture
- Flight Vehicle Test Adapter (PAF)
- AKM Mass Simulator
- Flight Interstage
- Overhead Crane
- Certified Facility Ground
- Vibration Table Adapter Plate
- Accelerometers & Cables
- Hand Tools

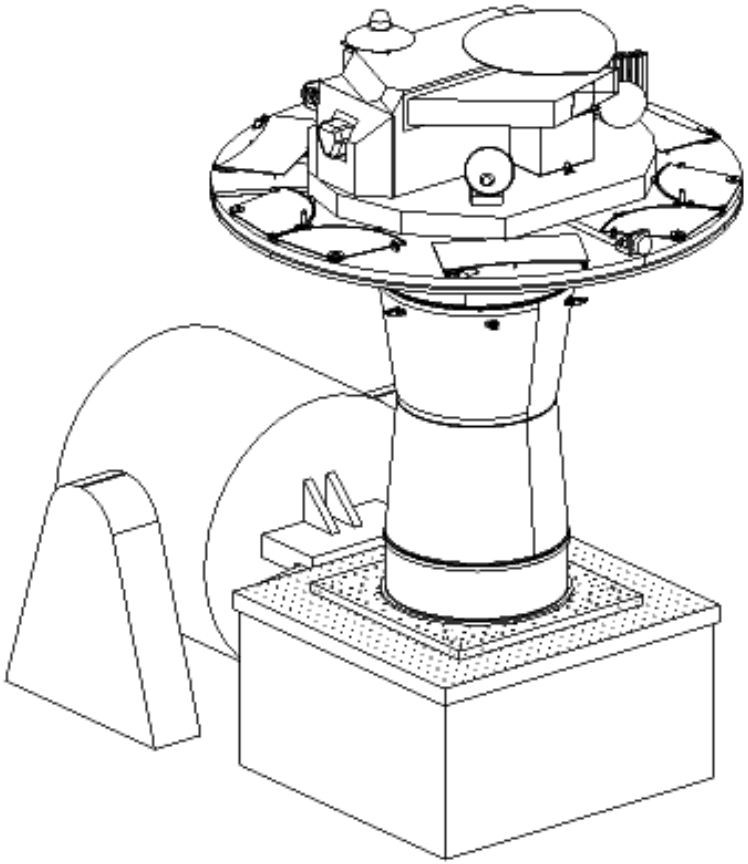
Axial Random Vibration
- Transport Observatory From Clean Tent to Acoustic Chamber
- Maintain Inst GN2 Purge
- Personnel Briefing
- Attach Observatory Lift Fixture to Crane
- Attach Lift Fixture to Observatory
- Lift Observatory Off Dolly and on to Interstage
- Install S/C Marmon Clamp
- Lift Flight Vehicle on to PAF
- Boeing Personnel Install Delta Clampband
- Disconnect Lift Fixture, Remove From Chamber
- Connect Accelerometer Cables, & Checkout
- Connect EAGE Cables
- Remove Non-Flight Covers
- Power Up Functions Active at Launch
- Perform Test, Notch as Required to DLL

Acoustic
- Set up Acoustic Chamber for Acoustic Test
- Perform Lower Level Test & Check Responses
- Power Up Functions Active at Launch
- Perform Full Level Test
- Perform Post Test Functional
- Power Down Sequence
- Reinstall Protective Covers
- Attach Observatory Lift Fixture to Crane
- Attach Lift Fixture to Flight Vehicle (FV)
- Unbolt PAF From Plate
- Lift FV + PAF Off Vibration Plate and Place on Dolly, Install Bolts
- Disconnect Lift Fixture
- Transport FV to Main Vibration Laboratory
- Maintain Instrument

Axial & Lateral Vibe Set-Up



Axial Vibration Test Set-Up



FAME Flight Vehicle Lateral Axes Vibration Test Set-Up

Lateral Random Vibration

Instrument GSE
- GN2 Purge Equipment
- Internal Accelerometers

Prerequisites
- Axial Vibe & Acoustic Tests Done
- ABCL
- Pre-Test Functional
- Test Procedure Released
- Observatory Lifting Procedure
- Vibration Table Adapter Plate Drilled For FV Test Adapter (PAF)
- Accelerometers Installed Per Procedure
- EAGE Checkout Performed
- FV Attached to PAF With Clampband

NRL GSE
- EAGE Test Racks, Cables
- Observatory Dolly
- Observatory Lift Fixture
- Overhead Crane
- Certified Facility Ground
- Vibration Table Adapter Plate
- Accelerometers & Cables
- Hand Tools

First Lateral Axis
- Maintain Instrument Purge
- Maintain Ground Connection
- Personnel Briefing
- Attach Observatory Lift Fixture to Crane
- Attach Lift Fixture to FV
- Lift FV/PAF Off Dolly and on to Vibration Adapter Plate
- Install PAF Hold Down Bolts
- Disconnect Lift Fixture
- Connect Accelerometer Cables & Checkout
- Connect EAGE Cables
- Remove Non-Flight Covers
- Power Up Functions Active at Launch
- Perform Test, Notch as Required to DLL
- Perform Post Test Functional
- Power Down Sequence
- Install Protective Covers

Second Lateral Axis
- Maintain Instrument Purge
- Maintain Ground Connection
- Personnel Briefing
- Attach Observatory Lift Fixture to Crane
- Attach Lift Fixture to FV
- Remove PAF Bolts
- Lift FV/PAF and Rotate 90° to Vibration Adapter Plate
- Install PAF Hold Down Bolts
- Disconnect Lift Fixture
- Verify Instrumentation
- Remove Non-Flight Covers
- Power Up functions Active at Launch
- Perform Test, Notch as Required to DLL
- Perform Post Test Functional
- Power Down Sequence
- Install Protective Covers

Pyroshock

Instrument GSE
- GN2 Purge Equipment
- Internal Accelerometers

Prerequisites
- Vibration & Acoustic Tests Done
- ABCL
- Pre-Test Functional
- Test Procedure Released
- Observatory Lifting Procedure
- Accelerometers Installed Per Procedure
- Boeing Delta Personnel Support
- NRL Safety Review & Support
- EAGE/OCS Rack Checkout Performed
- Observatory Attached to Interstage With Flight Marmon Clamp
- FV Attached to PAF With Clampband

NRL GSE
- EAGE Test Racks, Cables
- Ordnance Checkout Equipment
- Ordnance Firing Equipment
- Observatory Dolly
- Observatory Lift Fixture
- Overhead Crane
- Certified Facility Ground
- Vibration Table Adapter Plate
- Accelerometers & Cables
- Hand Tools

In A59 Vibration Lab
- Notify NRL Safety Office of Pending Ordnance Activities, Brief Personnel
- Maintain Instrument Purge
- Maintain Ground Connection
- Verify Instrumentation
- Attach Hydraset & Observatory Lift Fixture to Crane
- Place Extra Cover Over Observatory
- Attach Lift Fixture to Observatory
- Use Hydraset to Offload Flight Vehicle Weight
- Power up Functions Active at Separation
- Actuate Delta Clampband
- Separate FV From PAF Enough to Activate Separation Switches
- Set FV Back Down on PAF & Reinstall Clampband
- Use Hydraset to Offload Observatory Weight
- Actuate Interstage to Observatory Marmon Clamp Ordnance
- Separate Observatory from Interstage Enough to Activate Separation Switches
- Perform Post Test Functional
- Power Down Sequence

Thermal Vacuum

Instrument GSE
- Instrument Purge

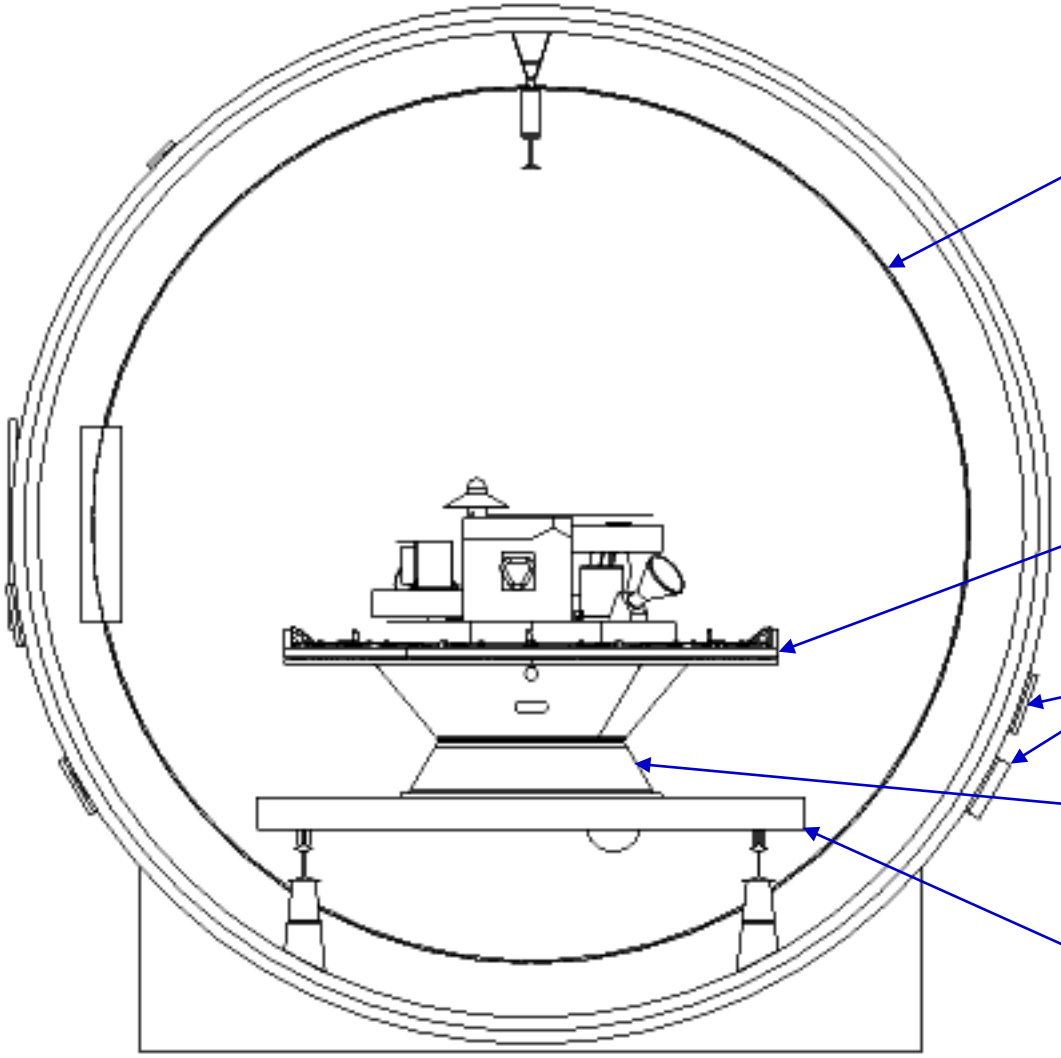
Prerequisites
- Vibe & Acoustic Completed
- Post Vibro-Acoustic Alignments Complete
- ABCL, Bus Prev. Baked Out
- Pre-Test Functional
- Test Procedure Released
- Chamber Pre-Conditioned
- Observatory Lifting Procedure
- Chamber Trolley Drilled to Accept TVAC Test Adapter

NRL GSE
- EAGE Test Racks, Cables
- Observatory Dolly
- Observatory Lift Fixture
- Observatory Test Adapter
- Certified Facility Ground
- Chamber Trolley & Plate
- Chamber Test Cables
- Cold Plates
- Thermocouples
- Thermocouple Test

Test Set-Up
- Install Test Thermocouples on Observatory in Clean Tent
- Attach Test Cables to Observatory
- Chamber Test Plate is on Trolley, Under Crane Footprint
- Transport Observatory From Clean Tent to TVAC Test Trolley
- Maintain Instrument GN2 Purge
- Maintain Ground Connection
- Personnel Briefing
- Attach Observatory Lift Fixture to Crane
- Attach Lift Fixture to Observatory
- Lift Observatory Off Dolly and on Test Adapter/Chamber Test Plate
- Install Marmon Clamp
- Disconnect Lift Fixture
- Remove Protective Covers
- Roll Trolley to Chamber & Install Plate in Chamber
- Set Up Cold Plates (as

TVAC Test
- Remove Instrument Bags
- Close Door, Repeat Functional
- Pull Vacuum, Perform Ambient Temperature Functional Test
- Go Hot With FPA Heaters on (Drive off H20 & Volatiles)
- Monitor TQCM & RGA, Proceed With Test When Outgassing Rate is Acceptable
- Perform 4 Thermal Cycles with Performance or Functional Test at Each Extreme
- At Appropriate Time, Deploy Instrument Aperture Covers
- Warm up Test Article From Last Cold Cycle
- Back Fill Chamber With Dry Nitrogen, Open Door
- Close Instrument Aperture Doors
- Attach Instrument Purge
- Perform Post Test Functional
- Remove Test Plate From

Observatory in TVAC Chamber



Chamber Shroud
- **I.D. = 16 Feet**
- **Length = 30 Feet**

Observatory

Test Cable Ports

Observatory Test Adapter

Chamber Test Plate
- **10 Foot X 10 Foot**

Mission Simulation

Instrument GSE
- GN2 Purge Equipment

Prerequisites
- ABCL
- Test Procedure Released
- Antenna Hats Installed
- EAGE Checkout Performed
- Mission Simulation Input Stimuli Prepared
- 24 Hours/Day Operator Coverage

NRL GSE
- EAGE Test Racks
- Test Cables
- Observatory Dolly
- Antenna Hats
- Certified Facility Ground

In Clean Tent
- Instrument GN2 Purge Maintained
- Attach EAGE Test Cables to Observatory
- Attach Test Cables to Antenna Hats
- Power Up Sequence
- Perform Bus Functional Test
- Verify Bus Telemetry
- Verify Instrument Passive Telemetry
- Power Up Instrument
- Verify Telemetry Data
- Perform Instrument Functional Checkout
- Begin Observatory Mission Simulation
- Operate System in Mission Type Mode Per Test Procedure Requirements
- Monitor System For Errors
- Observatory Power Down Sequence
- Analyze Mission Simulation Results

RF End-to-End Compatibility

Instrument GSE
- GN2 Purge Equipment

Prerequisites
- ABCL
- Test Procedure Released
- Antenna Hats Installed
- EAGE Checkout Performed
- DSN & BP Support Coordinated
- Functional Checkout of all Communications Functions & Circuits

NRL GSE
- EAGE Test Racks
- Test Cables
- Observatory Dolly
- Antenna Hats
- Certified Facility Ground

In Clean Tent
- Instrument GN2 Purge Maintained
- Attach EAGE Test Cables to Observatory
- Attach Test Cables to Antenna Hats
- Power Up Sequence
- Perform Bus Functional Test
- Verify Bus Telemetry
- Verify Instrument Passive Telemetry
- Power Up Instrument
- Verify Telemetry Data
- Perform Instrument Functional Checkout
- Monitor System For Errors
- Exercise All Communications Functions & Modes
- Verify Data Flows, Rates & Formatting
- Observatory Power Down Sequence
- Analyze Test Results, Document Verifications Completed

Post Environments Performance

Instrument GSE
- GN2 Purge Equipment

Prerequisites
- Environmental Testing Complete
- ABCL
- Test Procedure Released
- Antenna Hats Installed
- EAGE Checkout Performed

NRL GSE
- EAGE Test Racks
- Test Cables
- Observatory Dolly
- Antenna Hats
- Certified Facility Ground

In Clean Tent
- Instrument GN2 Purge Maintained
- Attach EAGE Test Cables to Observatory
- Attach Test Cables to Antenna Hats
- Power Up Sequence
- Perform Bus Functional Test
- Verify Bus Telemetry
- Verify Instrument Passive Telemetry
- Power up Instrument
- Verify Telemetry Data
- Perform Charge Injection Testing
- Flat Field Testing With Internal Source
- Optics Verification Using FPA LED
- Active Focus Adjustment and Return
- Begin Observatory Performance Test
- Monitor System For Errors
- Observatory Power Down Sequence
- Compare Results to Observatory Pre-Environmentals Performance Testing

Observatory Post Environments Performance Test Complete

Pre-Ship Readiness Review

Prerequisites
- Observatory Verifications/Buy Off Complete
- Environmental Testing Complete
- Open Item Audit and Evaluation (DRs, NMRS)
- Configuration Audits (As Built Configuration List)
- Complete Full Functional Analysis Complete
- Post-Environmental Test Alignments Complete
- Transportation Plan Complete & Released

Prep and Ship to KSC

Instrument GSE
- GN2 Purge Equipment

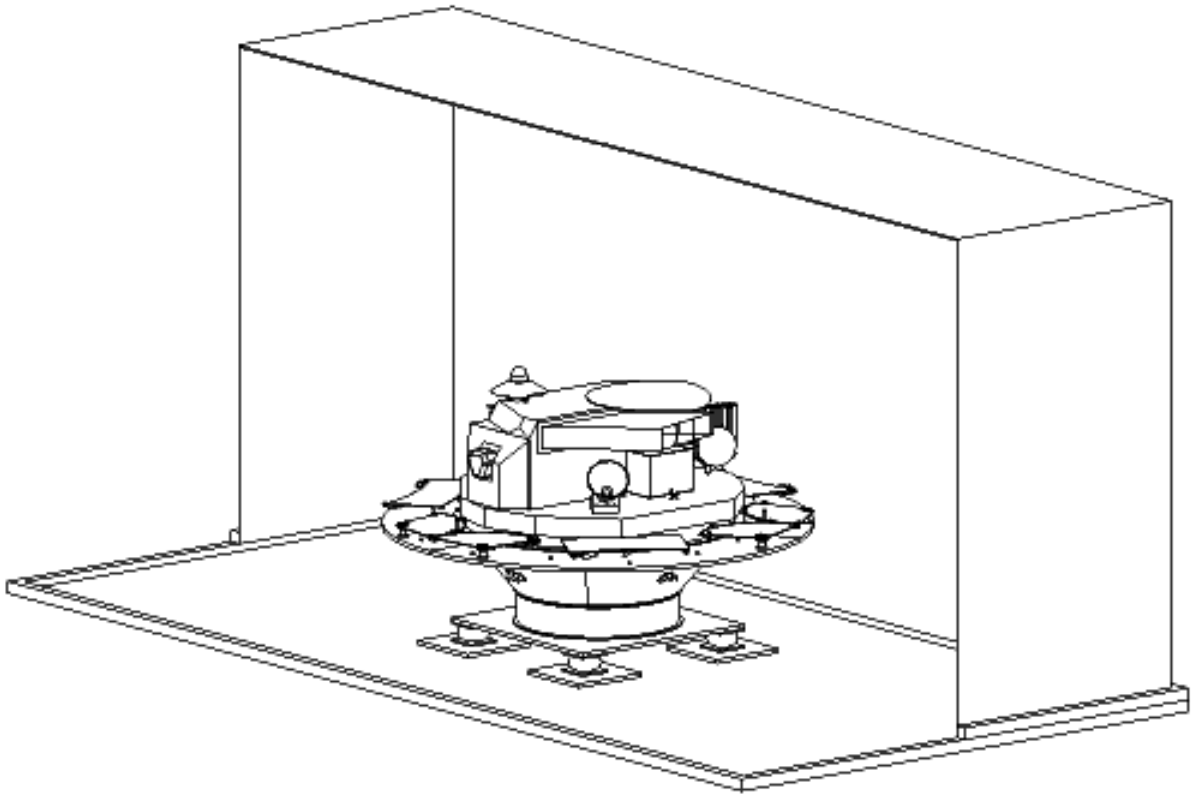
Prerequisites
- Pre-Ship Review Complete
- Field Processing Facility Prepared
- Container in High Bay, Cover Off
- Portable Instrument Purge Ready
- Environmental Control System Checked Out & Operational
- Protective Covers Installed
- GSE Packed Up
- Permits Obtained

NRL GSE
- Observatory Lifting Fixture
- Observatory Shipping Container
- MAGE to Remove Container Cover
- Forklifts
- Tractor to Pull Container Trailer

In Cleanroom
- Disconnect Observatory From EAGE
- Place Protective Covering on Observatory
- Roll Observatory Out of Clean Tent to Main High Bay
- Maintain Instrument Purge
- Maintain Ground Connection

In High Bay
- Hold Task Briefing
- Place Observatory Lift Fixture on Crane Hook
- Attach Lift Fixture to Observatory
- Remove Clampband
- Lift Observatory into Container
- Attach Observatory to Adapter
- Torque Bolts
- Attach Purge
- Make Final Preps, Take Photos
- Install Container Cover, Bolt Down
- Drive Trailer out of High Bay
- Initialize Environmental Control System
- Hold Pre-Transport Briefing
- Begin Transport
- Notify Personnel at Field Processing

FAME in Shipping Container



- **FAME Observatory Easily Fits Inside XTE/TRMM/MAP Shipping Container**
  - **Approximately 15 Inches of Lateral Clearance (Each Side)**
  - **Plenty of Height Available for Adapter and Shock Isolators**